Idaho National Laboratory

System Modeling and Simulation

Two valuable tools of the Systems Engineering discipline are modeling and simulation. INL systems engineers use industry proven modeling and simulation processes to determine system requirements; predict system performance; calculate process input, outputs, and throughput rates; support trade studies; estimate cost and schedules; and optimize processes. Modeling and simulation activities can reduce the cost of a project, improve the efficiency of a process, and provide a safe mechanism and environment for experimenting.

► **Modeling** – A model is a physical, mathematical, or logical representation of a system, phenomenon, or process. There are many classifications of models. Models may be predictive or interpretive, physical or mathematical, numerical or analytical, and continuous or discrete. INL systems engineers use tools such as Excel©, Mathcad©, Analytica©, ArcView©, AutoCAD©, and common programming languages to develop both physical and mathematical models.

► **Simulation** – A simulation is the implementation of a model over time. A simulation is an imitation of a system based on knowledge or assumptions about the behavior of the parts of that system, with the purpose of obtaining insight into the behavior of the whole system. Simulations bring models to life and show how a particular system, object, or phenomenon will behave. Like the models they represent, simulations can be continuous or discrete.

INL systems engineers have developed models using Flexsim[©], Extend[©], and Stella[©]. Flexsim and Extend are discrete-event process modeling tools. Stella is a continuous process modeling tool, often used in the field known as System Dynamics. Additional tools, which are less commonly used but perform the same functions, are also part of the INL Systems Engineering toolbox and skill set.

For More Information

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